

Anciently the Piman method of harvesting maize was to pull up the entire plant, or, in some cases, break it off at the ground, and throw it in piles, care being taken to keep separate the several colors of corn, since they had been planted in different plots; this was man's work. One reason for pulling up and removing the stalks was to have the field cleared for the next season. After Spanish contact, plants were sometimes cut off at the ground with an iron implement. Another historic development associated with turning stock into the field to eat the stalks was to husk the corn directly off the standing plant, the stalk being allowed to remain. The individual first ran a sharpened, hard stick of creosote bush or mesquite through the husk, then broke the ear out and threw it on a pile. In any event, harvesting was begun at a convenient place in the field, and did not proceed by designated direction as among some of the Pueblos. There was no ceremonial restriction against burning the husks, cobs or stalks. Cobs were used as fuel, particularly in cooking, and some stalks might be used in building the walls of a new structure. Saving purple husks to be used as a source of dye was unknown.

The plants were piled in one or more heaps, depending upon the size of the field, and women and older children usually gathered around the piles to remove unhusked ears from the stalks and throw them in piles. These ears were then carried to the dwelling in burden baskets (figured by Denamore⁸) by the women.

Although the Pimans husked some of their maize, particularly in selecting ears for seed, it was the common practice to partially roast their corn in unhusked ears by placing it in piles and covering with brush; this was set afire, green mesquite branches being used to stir and turn the ears, and, after several minutes of roasting, to throw them out on a bed of grass. During the roasting process much of the husk was burned away. These ears were dried on top of the house for

⁸ Denamore, Papago Music, pl. 10.

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- about ten days. Should rain come while the corn was drying, no special effort was made to protect it, as it was considered the corn would soon dry out uninjured, particularly if the ears were rearranged. One informant said the best way to determine whether corn was dry enough to be stored without molding was to test a few kernels by crushing with the teeth. Another said his method was to take a small handful of grains and shake them, the sound being an indicator of their dryness. Many of the Pima and Papago continue the roasting practice, and it is still not uncommon to find among both peoples storehouses in which partially roasted maize has been stored away unhusked. In some cases the process differed to the extent that the fire was made in an open pit and, when it had burned down, the ears were thrown on the embers to roast. It was considered that such partial roasting improved the keeping qualities and facilitated the grinding of corn.

A less frequent procedure, practiced mainly by the Papago, was to husk some of the ears and remove the grains, then parch and dry them on a sotol mat on the roof.

Shelling

Pima and Papago corn was regularly shelled before storing. After thoroughly drying, the unhusked, partially roasted corn might be shelled in any of three ways. The first, used with small quantities, was to remove a few grains at one end of the ear, then knock off the rest with the butt end of a cob. The second was to remove one or two rows of kernels the length of the ear with the aid of a stone scraper or a sharpened piece of creosote bush wood, then finish by twisting the ear with the hands. Finally, and most common, if one had a considerable amount of corn to be shelled it was placed on a sotol mat or cotton cloth and beaten with a club, then grains remaining on the ears were removed by hand. Unlike some of the Pueblos, there was no difference in the way seed and food corn were shelled. This was woman's acknowledged

5: Castetter & Bell N-5 (1938-1940) 1942

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This was women's acknowledged
work in which the man seldom participated, and after corn [462]
was shelled it was woman's work alone to care for it. At present 251
many of the Pima and Papago have mechanical shellers. 252
Shelled corn was placed on a mat or cloth and again allowed
to dry for two to three days. Grains were then winnowed in
a large basket by tossing into the air to remove chaff. Or this
might be done by tilting the basket about four feet above
ground and allowing the kernels to fall gradually on a sotol
mat or cotton cloth. Corn was always shelled before being
stored, then was ground into meal as needed.

Storing Food Corn

Crops were never hidden by the Pima for protection from Pi
enemies. These Indians usually stored their corn, after shell- Pa
ing, in large cylindrical nest-like bins, or granaries, made of 251
crudely coiled, thick bunches of arrowweed, which were very 415
durable and lasted for years. They needed no base, since the 285
roof or platform upon which they rested served this purpose,
although a layer of arrowweed was spread on the spot where
they were to stand. Over this granary was a low, cone-shaped
roof of arrowweed extending beyond the rim, and covered
with dirt. A cotton cloth was sometimes placed beneath the
roof and over the contents of each bin. Varying considerably
in size, the average bin was about eighteen inches tall by three
feet in diameter. Their manufacture has been described in
detail and figured by Kissell.⁴

These Pima granaries were usually placed on the roof,
less commonly in groups on a platform of logs to keep them
above the ground. Small sticks were placed across these logs
and covered with arrowweed branches, which also served as
a base for the bottomless bins. In post-Spanish times, groups
of such granaries on a platform were enclosed by a low fence
for protection against stock. In this connection, the reader is
referred to Emory, Russell, Clark and Kissell.⁵

⁴ Kissell, *Basketry of the Papago and Pima*, pp. 173-90.

⁵ Russell, *op. cit.*, fig. 4; Clark, *Lessons from Southwestern Indian Agriculture*, fig. 12; Kissell, *op. cit.*, figs. 29, 30; Emory, *op. cit.*, p. 85.

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251 The Pima nest-shaped granaries were not used by the Papago.
415 The very few storage baskets made by them were shaped like
285 a hive, or a barrel, with incurving top, therefore of smaller diameter at the neck, and were about four feet in diameter and three high. The sides were usually crude coiling of twisted grass sewed together with mesquite bark, since arrowweed is rarely to be found in their territory. These granaries usually were not placed on tops of buildings, but outdoors on stones or boards. Since, unlike the Pima granary, they had no roof, the opening was covered with an old flat basket or a broken olla. Being constantly exposed to the weather, Papago storage bins lasted only about two years.

However, Papago preferred to hide their food, and the usual expedient was to use jars rather than baskets. The most common jar was an old olla which had lost its porosity and no longer kept water cool. But special jars for storage purposes were made, as well as traded. The lid consisted of a piece of broken olla weighted with dirt or a stone.

Formerly the Papago also made temporary enclosures of sotol mats to store their grain.

A patriarchal Papago family stored its crops in several different places. A large supply was kept in the storehouse close to the village, while a few granary baskets might rest on stones near the dwelling, or, rarely, on the roof. A supplementary storage place was located in the flats not far from the base of the mountains, within easy reach of the winter camp. This was often a pit, deep enough to hold jars and baskets, and covered with brush or dirt. Here the baskets [224] were protected with branches of the very spiny cholla, *Opuntia Bigelovii*. During their winter travels, the family sent a man back to the storehouse now and then to get food, but they tried to leave the supply at the village untouched until spring, the period of food scarcity, and it was not drawn upon until absolutely necessary.

A second type of Pima storage container was of coarse coil, used to store maize, beans, wheat, wild seeds etc., and

5: Castetter & Bell N-5 (1938-1940) 1942

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was more carefully constructed than the arrowweed bin. The largest of these were globular in form among both peoples and might be as much as six feet tall and almost as wide. The smaller ones were rather bell-shaped among the Pima, and more or less barrel-shaped with the Papago. They were covered with a lid (usually the bottom of an old basket) and sealed with mud.⁶

After the introduction of wheat, the Pima made such baskets of a foundation of wheat straw bound together with strips of willow bark (*Salix nigra*), mesquite or catclaw (*Acacia Greggii*). Papago foundation elements were beargrass (*Neolina*), ocotillo or wheat straw, the binding material of yucca or mesquite bark. This is the type of basket which Bartlett⁷ observed among the Pima, and described as large vase-like baskets made of wheat straw ropes as thick as a man's arm, coiled into graceful forms and sewed together. He asserted that these held from ten to fifteen bushels and were filled with wheat and shelled corn. We have been unable to satisfy ourselves that this type of storage basket, figured and described by Russell⁸ and Kissell,⁹ is aboriginal. These were kept in a small storage house, never on roofs nor outdoors on platforms. This house is comparatively modern and of the same type as that described by Bartlett¹⁰ in 1852. It was eight or nine feet high, rectangular in outline, with walls made of stakes of ocotillo or sahuaro ribs set close together, and provided with a dirt-covered roof. Although customarily left open for free circulation of air, at times they were covered with a layer of mud.

At present neither Pima nor Papago shell their corn to any great extent before storing. Much of it is simply thrown on top of an ocotillo *ramada* and dried without husking, then shelled as needed.

⁶ Kissell, *op. cit.*, pp. 179-85.

⁷ Bartlett, *Narrative*, II, 294-96.

⁸ Russell, *op. cit.*, pp. 88, 143-48.

⁹ Kissell, *loc. cit.*

¹⁰ Bartlett, *loc. cit.*

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- It was, of course, impossible to store different colors of corn separately, for cross pollination naturally resulted in considerable mixture. However, this was done to the limits of practicability and ears of similar colors were placed together in separate piles when husking.

Seed Selection

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- Informants had little knowledge of the hereditary background of crop plants. Both Pima and Papago thought good crops resulted from good culture and that good qualities did not reside "in the blood." These Indians were not interested in the "sports" for they were regarded as freaks. Selection of seed corn was done by women largely, since they were the ones who did whatever husking was done, although this was not their special prerogative. While husking, good ears were put to one side and saved, or, in some cases, ears for seed were selected out when husked ears were being shelled. In no case were ears selected from the plants while standing in the field. The chief criteria were well-developed, mature, plump, clean, large grains, and little attention was paid to size or shape of the ear, or whether the grains were in regular rows. Ears badly worm-eaten were never selected for seed. All grains on a good seed ear were planted, for it was believed the ones at tip and butt were as good as those in the middle. However, the practice has now been modified in that tip and butt grains are not used for seed. Care was always exercised to keep seed corn pure as to color, so it was always taken from ears of unmixed solid colors.

It was not considered advisable to use corn that was more than two years old for seed, as it would not germinate well. Fresh seed was always planted if possible; however, seed left over in any year might be saved for planting the next.

Storing Seed Corn

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- Even with considerable care, rats, mice and weevils sometimes got into maize stored in baskets. Hence, when shelled

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and dried seed corn was to be stored it was mixed with wood ashes and placed in ollas. Among the Pima, a cotton cloth was then placed over the top of the olla and sealed with mud made of saline soil, while the Papago usually sealed such ollas by applying mud mixed with grass to the improvised lid. All the seed placed in an olla was of a single color and type, and there was never any mixture. Seed corn was eaten only in case of emergency. No seed or food crop was ever stored in hides.

In some cases seed ears were braided together in clusters by means of their husks, hung outdoors until dried, then suspended from the ceiling in the house.

There was no storage ritual for either food or seed corn.

Utilization of Corn

Informants said blue corn was used mostly for parching, white regarded as best for pinole and yellow as most suitable for tortillas, although these categories were not always maintained. The Pimans utilized a good deal of green corn for food, but in no case was a special planting made for this purpose, such ears simply being removed from regular crops. Several informants said it took a little more than "two rounds of the moon" from time of planting to get good roasting ears—about nine to ten weeks. This conforms with our own observation that native Pima and Papago corns produce silks and tassels within fifty to sixty days after planting. One way of determining its suitability for this purpose was by the condition of the silk, selection being made before the silk became entirely dry; another by judging the hardness of grains through the husk. It was eaten in a variety of ways; for example, directly off the ear after roasting unhusked on the embers of a mesquite brush fire, or such roasted corn was dried, then the grains cut from the ear and stored in ollas or shallow baskets; sometimes the grains were scraped from the ear, placed inside several corn husks, wrapped and tied at the ends with shreds of husks, resembling a tamale, and boiled.

Pi Paper bread was unknown to the Pimans. Corn pollen was
 never utilized, even ceremonially. One informant said that,
 as a boy, he used to see people putting ears heavily infested
 with corn smut on coals to roast, then taking off the smut and
 eating it without other preparation. The standard Pima
 meal consisted largely of cornmeal gruel.

PUMPKINS

Time of Harvest

Pi As indicated earlier in this chapter, the Papago made one
 planting of pumpkins—when the rains began in July, and
 this was harvested in October; the Pima made two plantings—
 the first when mesquite began to leaf out in spring, the second
 immediately after sahuaro harvest in July. The first sowing
 was harvested in late June, the second in October. All their
 varieties of pumpkins were sowed at the first planting, only
 cushaws in the second. Piman pumpkins were usually har-
 vested after maize and teparies had been put away, for many
 were still unripe at the maize harvest. Color of the fruit
 indicated whether they were mature enough to be gathered,
 the cushaw type usually ripening first, the cheese pumpkin
 last. It was known that light frosts would do them no damage,
 so it was not necessary to bring them in before that time.

Method of Harvest

Pi Anciently it was woman's work to gather the pumpkins.
 Pe Varieties were sorted into separate piles in the field to avoid
 a second handling, then carried to the house in a burden
 basket. Neither Papago nor Pima left a portion of the vine
 attached to the fruit, as was done by some tribes, but in
 severing pumpkins from the vines care was taken not to break
 the fruit stalk away from the pumpkin itself, otherwise it
 would rot readily.

Storing

Pi The average family had a crop of sixty to one hundred
 pumpkins, which were stored immediately after gathering.

They might be placed in a pile outdoors and covered with corn stalks, particularly if the crop were large, but more commonly were piled up in the storehouse with or without a covering of corn stalks. They could be kept at least until February, and in some cases as late as April. Cheese pumpkins kept best and longest, while the cushaws were recognized as poor keepers. If a pumpkin was seen to be rotting in storage it was sliced, then dried, in the manner described below for storing dried pumpkins; if disintegrated, it was discarded.

Anciently, each Pima home was provided with a single storehouse, generally an oval pit about eight feet long and two feet deep, covered by a gable roof of willow branches thatched with arrowweed. A forked pole of mesquite was set at each end of the oval and a beam placed lengthwise of the pit set in the forks of the poles. Willow branches were stuck into the ground along the brink of the pit and leaned against the beam. This storage house was used for pumpkins and, in historic times, watermelons and the like. It was practically identical with that described in detail by Spier¹¹ for the Maricopa. The same structure, with modifications, is still to be seen among the Pima. It is a cubical pit about three feet deep and as wide and long as required for the supply, now used exclusively for storing pumpkins. The floor of the pit is a layer of poles or logs covered with corn stalks on which the pumpkins are piled. In each corner is an erect forked pole, with cross beams of sahuaro ribs, and a rough arrowweed or cornstalk roof, and finally the whole covered with dirt.

Utilization of Pumpkins

When frost came, many pumpkins were still unripe and in various stages of development. These, particularly the cushaw type, were never discarded, but the skin removed by scraping, the flesh cut into pieces, cooked, usually with mesquite beans, and eaten immediately. At times, small immature pumpkins were gathered during summer and cooked

¹¹ Spier, *Yuman Tribes*, pp. 89-90.

5: Castetter & Bell N-5 (1938-1940) 1942

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Gerónimo we observed his wife threshing pink beans in the field on a floor thirty-five feet in diameter. This floor was ^{Pa} hard and somewhat depressed because of continued use over ²⁴⁴ a period of years, and there was a pole in the middle to which horses were tied at the time of wheat threshing. Several piles of pink bean, as well as of tepary, vines were on the floor. She sat in front of one of the piles of pink bean vines and flailed it heartily with a stick about five feet long and one and one-half inches thick. After beating for a time she removed some of the vines, then beat again, and finally removed all vines from the pile to the edge of the floor. These vines, even after heavy beating, retained some immature pods, and were dried further before receiving a final threshing. Before she had finished her work for the day it began to rain, so the beans and pods were carried in flat baskets and cotton cloths into the house, the vines being left on the threshing floor.

Both winnowed teparies and pink beans were laid in the sun on a mat or cotton cloth for several days to dry fully, after which, among the Pima, they were stored in close-coiled ^{Pa} baskets in the manner described for corn, or in ollas sealed ²⁵¹ with saline soil. All beans, regardless of kind, were sealed to protect them from mice, etc. Among the Papago, such baskets or ollas were covered with an old flat basket, or a piece of broken olla shaped to conform roughly to the opening, and sealed over with mud mixed with crushed mesquite stalks or grass. Both peoples segregated, and stored in separate baskets or ollas, the different colors of tepary (usually only white and brown were grown), as well as common pink beans.

Yield

Teparies are very drought resistant, although they respond well to additional moisture. In periods of drought ^{Pa} they often produce a good crop while common pink beans, ²⁴⁴ or *frijoles*, under the same conditions, are a total failure. Teparies are also much more resistant to insect attacks than are pink beans. That they bear a considerably larger number

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person mounted on another horse, or at times afoot, drove the animals around and over the wheat continuously for seven or eight hours, thus trampling out the grain. One man kept the wheat raked evenly over the floor. ^{Pi}
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When the task of threshing had been completed, a certain amount of winnowing was done by throwing the straw into the air, formerly by hand, then with improvised forks, and later with steel ones. Women, on their hands and knees, used branches of creosote bush for brushing up, gathering and carrying the coarse straw from the floor. Formerly most of this was burned although a small amount of the straw was saved for making baskets, etc. Small amounts of wheat, too green to be included in the general threshing, were put to one side, allowed to dry further, and flailed later.

Winnowing and Storing

Women then gathered the remaining grain and chaff into shallow winnowing baskets, about three feet across, held them at arm's length in the air and allowed the contents to fall gradually to the ground, the wind meanwhile blowing away the chaff. The grain was then placed in cotton cloths (later in sacks) and carried to the house for further winnowing on some windy day by dropping it from shallow baskets on to sotol mats or cotton cloths. The wheat was finally dried on these mats in the sun for two or three days, remaining bits of straw picked out by hand, then stored in baskets three or four feet high, usually made of grass after the fashion described under the storing of maize. The average Papago family had a crop of about two bushels. ^{Pi}
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Utilization of Wheat

When flour was needed the grain was pounded in a wooden mortar with a stone pestle, after being softened with a little water. At present, the grain, before being ground into flour on the metate, is dried thoroughly in the sun, then shaken in a basket until the hulls are blown away. ^{Pi}
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Papago informants said often in earlier days food was

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[262] scarce when May came around, and it was common to gather
matured heads of wheat, beat out the grains and eat them
before the general harvesting was begun.

WATERMELONS AND MUSKMELONS

Time and Method of Harvest

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[262] The Pimans were very fond of watermelons, moderately
so of muskmelons. The Pima usually made two plantings of
both, the first ready for harvesting in late June, the second in
October, although muskmelons were a little later in maturing
than were watermelons. The single Papago planting ripened
in October. Watermelons were tested for ripeness by their
sound when thumped; also they were considered mature
when the tendril on the stem of the melon dried and curled
up. However, they often were eaten before completely ripe.
Ripening of muskmelons was determined by their odor and
resistance to pressure. Pima informants said when the first
planting of watermelons had matured the fruit was picked,
then the vines irrigated and in about six weeks there was a
second, although smaller, crop.

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[462] Either men or women picked the melons when harvesting,
and put them in a pile. A few melons at a time were placed
on a mat or cotton cloth laid on the ground, and carried to
the house or storage pit, this usually being done by the men.

Storage

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251 The Pimans stored a goodly supply of watermelons for
winter use, but did not bury them in sand as did the lower
Colorado River tribes, although informants had heard of
the Yuma and Maricopa doing so. Formerly they were
stored in the oval pit with gable roof as described, under
"Storage of Pumpkins," but more recently Pimans have used
a cubical underground pit about four feet in each dimension,
slanting inward at the bottom on all sides and built on a hill
if possible. Poles were placed on the bottom of the pit and
covered with cornstalks, on which were placed alternate

5: Castetter & Bell N-5 (1938-1940) 1942

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layers of wheat straw or bean vines, and watermelons. Sides^{Pi} of the pit were not lined. For a roof, poles were laid across^{Pa} the opening and a layer of arrowweed covered with dirt over²⁵¹ all. Earth at one end of the pit was dug away to allow a vertical entrance about three feet high, which was covered with a framework of slender poles. Watermelons thus stored kept well for as much as three to four months. Informants said they kept better if a six-inch section of the vine was left attached to the fruit at the time of picking.

Watermelon and muskmelon seed for planting was always^{Pi} selected on the basis of size and quality of fruits, thus from^{Pa} the largest and sweetest specimens. [242]

Utilization

Fruits when ripe, particularly watermelons, were com-^{Pi} monly eaten fresh in great quantities, although at times^{Pa} preserves were made from the rind by cooking without^[252] sweetening. Watermelons were never dried. Muskmelons did not store well so had to be eaten relatively soon after maturity, or dried for future use.

The method for drying muskmelons was similar to that described for pumpkins, except that the melon was peeled and cut lengthwise, the soft pulp and seeds scraped away. Only thoroughly ripened fruits were used in this manner. The short straight strips were then dried on top of the house or *ramada* for several days, or until they could be worked well. A number of strips were placed side by side and tied into bundles, dried further on a shed, twisted into hanks and stored in baskets, or in ollas with a cloth over the contents, covered with a piece of broken olla, then sealed with mud. In spring they were eaten dry without boiling or preparation of any kind unless they had become quite hard, in which case^{Pi} they were boiled and eaten with pinole. At times the dried^{Pa} melon was toasted over a fire to soften, then eaten by alter-^[264] nately taking pieces of melon and drinking pinole. This practice is very rare today. Unlike pumpkins, such dried

- ^{Pi} melons did not constitute a staple but were considered more
- ²⁵¹ of a delicacy, being sweet and very palatable.

CHILI

^{Pi} Chili (*Capsicum annuum*) is an introduced crop among
^{Pa} the Pimans and is recognized by them as such, but its cultivation
²⁴⁴ was not taken over nearly as extensively as among the Pueblo Indians, for example; only a few of the Pimas grew it and even at present it is not cultivated to any extent, for most of them purchase their supply. The chief variety grown today is Anaheim. Chili is grown by the Papago only in very favorable places, since it requires a more reliable source of water than is ordinarily found in Papago territory. These people continue to depend upon the wild *chiltepinquin* (see Chapter IV).

^{Pi} Pima made a single planting of chili, and this when
²⁴⁴ mesquite began to leaf out in late March or early April. It was sowed in small vegetable gardens and harvested in early November. The ripe pods were pulled off by hand and the green ones allowed to remain if weather conditions indicated they might still ripen. However, if frost were indicated, the plants were cut off at the base and piled in the field, and many of the green pods would ripen there. Green fruits were often roasted, then peeled and eaten. At times these dried roasted fruits were stored in sealed ollas and when utilized were steeped in hot water to soften. Those that had not dried readily were tied into strings and hung outdoors, then stored in ollas when dry. Another way of preparing the unripe fruits was to roast and peel them, then pound in a mortar and shape into a large cake, which was dried for future use. When needed, a piece of the mass was broken off and utilized as seasoning.

^{Pi} Ripe fruits were spread on a cotton cloth on the ground
²⁴⁴ or on a layer of sticks and allowed to dry for four or five days,
²⁵¹ being stirred occasionally to facilitate the process. When fully

A SAHUARO CAMP

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me from finishing the operation by telling him to ask 124
eight additional dollars for his consent.

Their camp consisted simply of a roof of branches 342
resting on four poles, sufficient to provide some shade
during the day. Early in the morning all the female 222
members of the household could be seen proceeding on 251 ●
their fruit-gathering expedition, each armed with a large 415
basket and the usual pole, about twenty feet long and
made from two pieces of sahuaro rib. At the top of the
pole, as well as lower down, there is a kind of hook
made by tying crosswise in these two places a small
piece of greasewood by the aid of which the spiny fruit
is broken off. Two or three hours later they returned,
each carrying on her head her share of a heavy har- [482]
vest. The skin with its spines had been removed in
the field, so the inside of the huge water-tight basket
presented an appetizing mass of crimson fruit pulp, as
well as a great amount of similarly colored juice, which
would keep for a few hours only. Most of the contents
of the baskets was immediately emptied into large jars,
to be boiled for about two hours, when the mass is
strained in order to separate the numerous small black
seeds. The juice is boiled for hours longer until it be-
comes sirup (*sitoli*), which is kept for future use in small
earthen-ware jars, each neatly sealed with a piece of
broken pottery and sticky mud. Being pleasant to the
taste and much superior to molasses, I found this sirup
excellent as part of my provisions. I also relished the
fresh juice of the fruit when brought in cool in the
morning.

609 sion, the Indians taking us to be *celadores* or mounted inspectors from the Sasabe custom-house, who at uncertain and mostly long intervals make tours along the border line. There are two hundred miles from Sasabe to the Colorado River, but the inspectors seldom or never go beyond Sonoita. The Indians seemed relieved at being correctly informed and were kind and gentle.

[191] They no doubt understand Spanish, but if spoken to would answer only in Papago. Two kinds of small

[136] wading birds were noticed at the dam and in the morning up to noon the coyotes would fearlessly come to drink. Some Mexican cowboys passing by lassoed one and then let it go again.

241 On the day of our departure we passed one of the fine fields which the Papagoes have here. The maize had been stored away, but two huge heaps of squashes were piled on the field; near one of them sat two women, cutting them up into long ribbons. When nearly dry these are folded up in convenient bundles and kept for winter use. There was only one small jacal in the middle of this field of plenty, and thither I directed my steps to buy some watermelons. Here also was a woman mak-

241 ing squash ribbons, great numbers of which were hang-

251 ing, festoon-like, to dry from the branches of a tree outside.

261 All these women came from other parts of the country
476 and were preparing to take away as much as they wished in accordance with the ancient custom which prevails at harvest time of those who have sharing with those who are less fortunate. If a Papago is known to have been

262 pepo; *Cucurbita moschata*), dried chili (*Capsicum annuum*), a native spinach or pigweed (*Amaranthus Palmeri*), and whole [25] wheat and peeled wheat (*Triticum vulgare*). The majority of these foods are dried for storage.

222 The Papagos utilize for consumption the available varieties
262 of cactus as they did aboriginally, gathering the fruits of the
252 cholla (*Opuntia echinocarpa*) and various other kinds of prickly pear (*Opuntia* spp.) and the sahuaro (*Carnegiea gigantea*). The fruits are eaten in large quantities during season and in most instances these are baked for 24 hours in pits partially filled with hot stones; the surplus is dried for storage. The sahuaro fruit is often prepared as a syrup or jam. The seeds of the cactus are dried and later these are ground into a meal from which they prepare a gruel. In most of their cooking the Papagos use quantities of fat, especially lard or vegetable shortening.

146 In general it can be said that the diet of these people is one rich in cooked carbohydrate, with occasional animal protein and, in rare instances, cooked green fruits or vegetables. The Papagos drink but little milk (except from the breast during infancy); most of the natives in the outlying districts drink no dairy milk at all. As a result of their diet numerous avitaminoses occur, superimposed one on the other; the deficiencies may be subclinical or threshold in character due to a continued shortage of vitamins in the diet.

ASCORBIC ACID STUDIES

114 Various studies in the literature indicate that the ascorbic
146 acid content of the plasma and the amount excreted are an index of the previous dietary intake (Belser, Hauck and Storrick, '39; Heinemann, '38). On the other hand, reports have appeared where the blood analyses themselves are used to determine the actual state of ascorbic acid nutrition (Minot, Dodd, Keller and Frank, '40). In some instances the blood and urine analyses have been supplemented by the determination of ascorbic acid in the dietary intake (Todhunter and Robbins, '40; Goldsmith, Ogaard and Gowe, '41). However, as Bessey and White ('42) have pointed out, the practical problem is one

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222 only a day the women went alone; if it were a longer trip, whole families went. The younger women and boys fetched water daily, the men hunted and at times helped in the picking. In such cases the regular community life was transferred to the camp.

25/ The picking of a crop almost always entailed measures for storage, both to keep it from spoiling and to lighten the load on the return trip. The fresh product could be eaten only by those who were in the camping party since the hot sun would shrivel it within a few hours after picking; therefore, part of the gathering technique was the roasting, boiling, or winnowing of the product.

Greens

222 Small succulent plants:

262 mo'otari (*Franseria tenuifolia*) stalks, Summer
 Lambsquarter, hiwitcu (*Chenopodium murale*) stalks, Summer
 Pigweed, tchuhukia (*Amaranthus palmeri*) leaves, July, August
 Lambsquarter, tci'ari (*Chenopodium* sp.) leaves, July, August
 Cafiaigre (*Rumex hymenosepalus*) leaves, Spring
 Dandelion (*Taraxacum officinale*) leaves cooked or uncooked
 Saltbush (*Atriplex wrightii*) branches, Summer

Larger, coarser plants:

Cane cactus, cholla, wipinoi (*Opuntia arborescens*) Summer
 Jumping cholla, ha:nam (*Opuntia fulgida*) young shoots and buds, Summer
 Many-colored tree cholla (*Opuntia versicolor*) young shoots and buds, Summer
 Cholla, tci'orim (*Opuntia echinocarpa*) buds, May
 Prickly pear cactus, nohwi (*Opuntia engelmannii*) leaves with thorns scraped off, sliced in strips, Summer
 Mescal, American aloe, century plant, a'o't (*Agave americana*) crown with leaves removed, Winter; central flowering stalk before it emerges, Spring
 Sotol, umu'k (*Dasyllirion wheeleri*) crown with leaves removed; central flowering stalk before it emerges, May
 Fishhook cactus, barrel cactus, viznaga, tci'aur (*Echinocactus wislizeni*) pulp, May
 Night-blooming cereus, reina de noche, ho'o'k iva (*Cereus greggii*) stalks

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The small succulent plants used as greens grow near²²² the villages and can usually be gathered within a day's²⁵² excursion. One informant said: "In the afternoon, my mother-in-law would say to us, 'let us go out and gather amaranth.' So I and my sisters-in-law would take our carrying nets, walk about half a mile from the camp and fill them. Then we made soup and that was all we had^[264] for supper" (the main meal). This and the other small greens mentioned are never dried and stored but, as with other fresh crops, the family lives on them almost exclusively while they last. The branches of the saltbush (*Atriplex wrightii*)^[263] are used for seasoning either in cooking or in pit-baking.

The buds and joints of the five species of *Opuntia* mentioned constitute a staple crop, probably because they grow so plentifully, and *O. echinocarpa* is found in abundance on the nearby hillsides.

The branches of the chollas are composed of easily de-²²² tachable joints; the flower buds which develop at the tips of the branches are gathered as they come out in May. Whole cholla joints, as well as the buds, are pit-baked and dried. Women go out in parties to gather the crop, this^[417] being done with wooden tongs made of a length of giant cactus rib (*Carnegiea gigantea*), split in two. The buds or joints are collected in coiled basket bowls and brought to a central point where an old woman directs the baking. When the picking is ended, a pit is dug, stones placed in²⁵¹ it and heated with a mesquite fire (*Prosopis velutina*), since creosote bush (*Covillea glutinosa*) burns up too quickly. When the stones are hot they are removed and the pit lined with ink weed (*Dondia nigra*) or with grass. Next a layer of buds or joints is placed in the pit, then hot stones, then the pit filled with alternate layers of ink weed or grass and buds and covered with earth. They camp all night while the product is baking, and roast in the campfire ashes that^[247] portion of the product which has been reserved for their evening meal. The women carry home the roasted cholla

251 and continue to go out for other batches until a large area surrounding the village has been picked over. The roasted buds are used with greens of the annual salt bush (*Atriplex wrightii*) or lambsquarter (*Chenopodium alba*) as a sort of vegetable stew.

222 Although all Papagos eat mescal (*Agave americana*),
251 many of them get it by trade rather than at first hand. It
[438] grows on the hills along the present international border and is usually gathered by parties who go to Sonora to work during their winter wanderings, stopping for a week or two to pluck and bake the mescal, and when necessary storing it in pits until they are ready to carry it home.

[412] Digging sticks of any hard wood, made chisel-shaped by pounding with a stone and hardened in the fire, are used to hack the plants off at the ground. The spiny leaves are then chopped off with a mescai hatchet, a semi-circular stone blade of granite or diorite.

251 The agave is pit-baked for twelve or more hours in the same way as are the cholla buds and joints. When this is done the remains of the leaves are pulled off, leaving an inner succulent mass about the size of a cauliflower. This has a slimy consistency and a sweet taste which is highly regarded. It is kept in jars to be eaten a little at a time or traded as a delicacy.

222 The flower stalks of the American aloe (*Agave americana*), of sotol (*Dasylirion wheeleri*), and the shoots of the night-blooming cereus (*Cereus greggii*) are also eaten as greens. They are not very extensively utilized however.

[285] Sotol is also a source of basketry material, but if the inner tender leaves have been taken for this purpose, the flower stalk does not develop. The flower stalks are dug out of the plants with a long stick having a chisel-like end, and cooked immediately but never stored.

252 An upright species of prickly pear cactus (*Opuntia*
222 sp.) is utilized by washing the large waxy flowers to remove their sticky secretion then frying them in grease, formerly deer fat, now lard.

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Another occasional food, or more accurately a drink, is ²⁷²the pulp of the *viznaga*, barrel or niggerhead cactus (*Echinocactus wislizeni*). If one becomes thirsty on a journey he cuts the top off a plant with a sharp stone, pounds the pulp and scoops out the juice with the half gourd (*Lagen-^[145]**aria vulgaris*) which he carries as a drinking and eating vessel.

According to Thackery and Leding (25), the fruits of the *viznaga* are cut up and cooked with cornmeal or other material, the seeds being discarded.

Root, Tuber, and Bulk Crops

Sand-root, *cua't* (*Ammobroma sonorae*) October ²⁶²
Wild potato, *taiareti*. A climbing species of *Solanum*. Summer ²²²
mo'otari (*Franseria tenuifolia*) Summer
Wild onion, *sipuia* (Span.) (*Allium unifolium*) May
Papago Blue Bells, *Covena*, *ha'at* (*Brodiaea capitata* var. *pauciflora*)
April
Night-blooming cereus, *ho'o'k i'a* (*Cereus greggii*)

The staple root crops are the sand-root (*Ammobroma²²²* *sonorae*) and the root of *Franseria tenuifolia*, both of which appear on the flood plains near the villages after the rains. Whole families go out with digging sticks usually in October to gather the roots of these species, and live upon them while they last. Any surplus is sun-dried on the house-^[251] roofs and stored in jars.

The sand-root has been used from time immemorial by the Papago and is parasitic upon the roots of the small desert shrubs *Coldenia plicata* and *C. Palmeri*, as well as on *Eriogonum deserticolum*. It is to be found in parts of the Southwest where the average rainfall is between only two and five inches, and is eagerly sought by the Papagos, who ^[252]consider it a most excellent food; it is eaten either raw or roasted (6, 17, 24).

Palmer (20) records that these people dried and ground ²⁵²the stems of the sand-root with mesquite beans (*Prosopis*

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Prickly pear cactus, *nohwi* (*Opuntia engelmannii*) June, October. 26.2

Cholla (*Opuntia fulgida*) August 27.2

Cholla, *teforim* (*Opuntia echinocarpa*) August

Soapweed, datil, *hoi* (*Yucca baccata*) (fruit *howite*) Summer

Of the small fruits, *Condalia spathulata* is eaten only raw and not thought worth preserving. If hackberries (*Celtis reticulata*) or mulberries (*Morus microphylla*) are found near the village, carrying baskets are filled with whole branches of them by the women. Clusters of mistletoe (*Phoradendron californicum*), which often grows on the mesquite bush (*Prosopis velutina*), are gathered, their branches laid on mats, dried and the berries rolled free. These berries form a sticky mass which is further sundried and stored. The somewhat larger boxthorn berries (*Lycium fremontii*) are picked, dried and eaten like raisins. Only the fruit of the lote bush (*Zizyphus lycioides*) is cooked, and this is boiled to a syrup like the cactus fruits.

These people now use as seasoning the very pungent bird Cayenne pepper or spur pepper (*Capsicum frutescens* var. *baccatum*) which grows in the Baboquivari Mountains and apparently nowhere else in the state. This plant may have been introduced by the Papagos and is very much used by them in their daily life as a condiment on the table or for cooking with beans or other foods. It is this species that is cultivated farther south for the hot peppers. As one drives over the Papago Reservation and stops at trading posts he invariably finds dishes of these small, dry, red, extremely pungent berries offered for sale. These always find ready buyers among the Papagos and Mexicans.

Acorns (*Quercus emoryi*) ripen in July a little later than the giant cactus fruit, but grow in only a few hilly places, mostly at the south of the Papago territory, and are gathered on a long camping excursion similar to that for the sahuaro fruit. For the most part acorns are eaten fresh from the shell. Bucknuts (*Simmondsia californica*) are similarly eaten though not in quantity. Russell (22)

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The fruit, if fully ripe, splits open when it hits the ground; if not, the woman twists off the fruit stalk which bears a hard circular calyx with sharp edges and with this she splits the fruit. In either case she scoops out the pulp from each half with two motions of her thumb and throws it into her basket, while the thorny shell she throws on the ground, taking care that its red lining falls uppermost, for this hastens the rain.

After each round the women pour the newly gathered pulp, of a deep crimson color, into a water-tight basket and soak it to remove the black seeds, which will later be used for flour. Since it shrivels within a few hours if left in the sun, they cook their harvest daily, usually at midday which is too hot for pulp gathering. The mother or mother-in-law officiates on this important occasion. She drains the water from the pulp, some of which has been soaking since the night before, breaks up the masses, shakes out as many seeds as possible, washes and dries these on a mat in the sun, and places them in a jar. The pulp, with double the quantity of water, is brought to a boil in a clay pot, then removed from the fire and placed in a straining basket. The liquid drained off is placed on the fire and boiled to a syrup, this being set aside from day to day. When the whole quantity is at hand it is sealed in a jar made air-tight by cementing a potsherd over its mouth with adobe mixed with fine grass or a transparent yellowish-brown "gum" gathered from the *samo prieto* (*Coursetia glandulosa*) upon which it is produced by a scale insect (*Tachardiella fulgens*) (25). This is the liquid from which the ceremonial drink *navai't* is made and each family keeps its supply to be fermented at the time of the general ceremony (see also Densmore, 9).

When the juice has been drained off as described above there remain the pulp and the seeds which can also be utilized. All households make cactus jam, the most important sweet in their diet, and for this only a portion of the juice is drained off. The remaining moist pulp is boiled to a sweet, sticky mass, looking much like raspberry jam.

251 If the liquid be drained off completely there remains a
252 dry mass of fiber and seed which is further dessicated on the housetop. It is then beaten with a stick to separate the seeds and these are parched and stored; they may be used to make meal cake or as chicken feed. One final product from the giant cactus is oil, which can be extracted from the seeds by parching them, grinding and adding water, after which a small quantity of oil comes to the surface. The pulp, instead of being disposed of as described above, may be sun-dried, stored, and cooked up as needed to make syrup, or it may be eaten dry or after being moistened with water (25).

222 The smaller fruit of the organ pipe cactus or pitahaya (*Lemaireocereus thurberi*) is as highly prized as that of the giant cactus and may be treated in the same way. It is less common, however, and grows only in the southern part of Papagueria and in parts of modern Sonora. It fruits twice a year and its many low branches are so plentifully
[822] covered that the Papago name for Milky Way is "the second harvest of Pitahaya."

114 The word *pitahaya* was used rather loosely by the
222 Spaniards as a name for several of the tall cacti of Spanish America, together with their fruits including the sahuaro (*Carnegiea gigantea*). Perhaps the earliest reference to the pitahaya is one quoted by Bancroft (1) who states that Juan de Oñate, conqueror and governor of New Mexico, while on an exploratory journey westward from his headquarters on the Rio Grande in 1604, reported that he at length came to a country where the "tierra caliente began to produce the pitahaya." Padre Kino (3), the Jesuit friar, whose explorations from 1687 to 1710 covered southern Arizona as far west as the Colorado River, recorded in his memoirs the use of cactus fruits by the Indians of that region.

222 The Papago distinguish two kinds of edible prickly pears (*Opuntia* sp.), one of which produces chills and nausea in susceptible people. Groups of women pluck the

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fruits with tongs, pile them on the ground and brush them²²² vigorously with creosote bush branches (*Covillea glutinosa*) to remove the spines, then carry them home and use them as an adjunct to a meal. The usual method of utilizing the²⁵¹ fruit is to eat it fresh in large quantities while the supply²⁵² lasts, unused fruit being dried or made into syrup. To dry²²² it they scoop out the pulp and remove the large, hard seeds with the fingers, then spread grass on the ground and sun-dry the pulp on it for two days, after which it can be stored in a sealed jar. To make syrup they mash the pulp in a basket with a stick, squeeze out the juice and strain it twice; it is then boiled and again strained.

The fruits of the two chollas (*Opuntia fulgida* and *O. echinocarpa*) ripen in late summer, and are handled in the same manner as the buds, that is, gathered, pit-baked and carried home (25).

Similarly the datil fruit (*Yucca baccata*) constitutes an important staple crop which is gathered and preserved. As much as possible of the banana-shaped, sweet, pulpy fruit is eaten fresh and some carried home for that purpose. A gruel is also made from the fresh fruit. The seeds are removed by hand and the pulp ground on the metate, some cornmeal being rubbed on the metate and muller to prevent sticking. The pulp is then cooked with cornmeal and the seeds are dried.

In preserving the fruit two methods are employed. One²⁵¹ is to open the fruit in the field and remove the seeds and fiber, these being taken home in sacks to dry. In drying they are spread on racks of sahuaro ribs (*Carnegiea gigantea*) in the storehouse, and when perfectly dry are beaten on a mat to remove the fiber. The released seeds form hard lumps which are stored in baskets and ground into meal when needed. The other method is to dry the pulp in the field. Women scrape it out with the fingers, pat it into cakes and dry these on a hot stone. This drying is not sufficient for storage so the cakes are taken home and spread on the roof, and when thoroughly dry are stored in a jar.

Seeds³

- 262 Sacaton, ohki (*Sporobolus wrightii*) September
 222 Peppergrass, ka:cowani (*Lepidium thurberi*) September
 opom (*Monolepis nuttalliana*) September
 Pigweed, amaranth, tchukia (*Amaranthus palmeri*) September
 Tansy mustard, cu'uwa't (*Sophia pinnata*) September
 Mesquite, kui (*Prosopis velutina*) August
 Little leaf horse bean, palo verde, ku'k tciata'k (*Parkinsonia microphylla*) August
 Jerusalem thorn, bagote, palo verde (*Parkinsonia aculeata*) August
 Ironwood, palo de hierro, hoitkam (*Oleña tesota*) August
 Devil Claw, unicorn plant, ihu'k (*Martynia fragrans*)

22 The species of grass seed which ripen in September and October around the villages are collected and winnowed. One informant said "We would work all day and feel as though we had done so much and there would be about a cupful." One method of winnowing is to pull up whole plants, lay them on a fiber mat and beat out the seeds with a stick. Another method, which is used with a very light grass, sacaton (*Sporobolus wrightii*), is to burn the whole patch, then sweep the seeds off the ground. With *Monolepis nuttalliana*, the seeds of which are difficult to remove, the method consists in boiling the stems, then collecting the seeds from the bottom of the pot. The seeds of Amaranth or pigweed (*Amaranthus palmeri*), so important among the Aztecs, are also collected and utilized as an important source of food. The most common of the seed crops, however, is tansy mustard (*Sophia pinnata*).

251 The technique for storage of all seeds is basket-winnowing, parching and sun-drying. This winnowing is the same as that practiced by the Pimas and many of the Yumans, and consists in shaking the seeds horizontally in a flat basket, now and then jogging the basket so that the chaff is brought to its upper edge to be taken off by the wind. Seeds are never stored without cooking for fear of mildew. While parching they are placed in a flat basket with a few

3. Botanically some of these are fruits.

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embers and shaken constantly to prevent burning. Or they²⁵¹ are placed on a piece of broken pottery jar directly over the coals and the seeds stirred with a stick; after parching they are spread on the house roof for thorough dehydration before being stored.

Mesquite beans (*Prosopis velutina*) ripen in August²²² near the summer villages and formerly constituted an im-²⁵¹portant crop. The pod, which was much prized, has a²⁵² sweetish taste and could be eaten fresh.

These beans could be either ground up like other seeds as flour, or the bean and pod could be pounded into a pulpy mass in a mortar, since they were too sticky for the metate. The resulting pulp was boiled. Beans were dried in the pod if they were picked near home, as the bulk was not too much to carry. In that event they were spread on the house roof and turned until thoroughly dried, then put away in a jar. If bulk needed to be reduced the sun-dried pods were flailed to beat out the seeds, the whole then winnowed in a basket and the seeds parched and stored.

The other legumes, ironwood (*Olneya tesota*) and palo verde (*Parinsonia microphylla* and *P. aculeata*) produce beans which were flailed, winnowed, and parched in the same way as that described for mesquite.⁴ The seeds of the devil's claw (*Martynia fragrans*) are also boiled and eaten.

2. BEVERAGES

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Sahuaro, giant cactus, *ha:canyi* (*Carnegie gigantea*) juice fermented
Pitahaya, organ pipe cactus, *teutcuic* (*Lemaireocereus thurberi*) juice
fermented

Prickly pear cactus, *nohwi* (*Opuntia engelmannii*) --- juice fermented

Lote bush, *u:s teut'pa't* (*Zizyphus lycioides*) ----- juice fermented

Jimson weed, thorn apple, *kotata'p* (*Datura meteloides*) root ground
and infused

Tansy mustard, *cu'uwa't* (*Sophia pinnata*) ----- made into tea

Sage (*Salvia columbaria*) ----- made into tea

Broomweed (*Baccharis sarothroides*) ----- made into tea

Joint Fir (*Ephedra nevadensis*) ----- made into tea

4. The chemical composition of the beans of *Parinsonia aculeata* has been investigated by Robert A. Greene, Bot. Gaz. 54:411-415, 1932. He has found the composition of the whole bean to be similar to that of alfalfa hay or mesquite beans.

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241 "At least one variety of the common kidney bean, pole bean,
174 bunch bean, etc., was known to the natives before the advent of the Spaniards."

241 Teparies and frijoles are still planted at the beginning of the rainy season in holes three feet apart and six inches deep. When harvested the vines are laid on the ground and the beans threshed out with a stick; or if a very large crop, it may be threshed with horses, as is wheat. The threshed
● [25] beans are dried on the ground or roof and stored in jars. Vetch (*Vicia* sp.), lentils (*Lens esculenta*) and chick peas or garabanzos (*Cicer arietinum*), all of which have been introduced, are planted in February with the wheat and harvested like wheat in May, but otherwise are treated like beans.

CORN (*Zea mays*)

- [262] Red corn ----- *si-wihpiki huhnyi*
243 White corn ----- *to:ta huhnyi*
1. large grains
 2. small grains
- Yellow corn ----- *s'uam huhnyi*
1. small, irregular grains, like popcorn
 2. large grains, soft
 3. a modern variety, attributed to the Navajo
- Blue corn ----- *e'tciata'ki huhnyi*
1. small, regular grains
 2. large, irregular grains (*ku:pi*)
- Crazy corn, grains of all colors ----- *tcihpawi huhnyi*
Laughing corn, mixed red and white, large grains ----- *hihihmi huhnyi*

All these varieties are mentioned in Papago planting songs but at present the only ones commonly found are yellow and white. Gifford (13) mentions both a yellow and white and a white soft maize, also a flint maize, grown by the Cocopa under the Papago name of *huhnyi* (corn) and credited to the Papagos.

The different colored corn grains were stored and planted separately and never allowed to mix. When harvested the grains might be removed from the cob with a
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stone scraper, then parched and dried on a mat on the roof, or whole ears might be roasted. In this case a fire was made in an open pit and the ears thrown in on the hot coals when it had burned down. Two women turned the ears with green mesquite sticks (*Prosopis velutina*), allowing them to roast for several minutes and throwing them out on a bed of grass. These roasted ears were dried and beaten to remove the grains, which were then winnowed and stored in a basket to be ground into meal when needed; they were also cooked whole with meat. 243
251

Corn, like the other aboriginal staples, squash and beans, was planted with an invocation, and the ceremonies centered around it as the most important crop. There are songs for every stage of its progress: leaf appearing, stalk growing high, ear forming, and tassel forming. Almost all ceremonial orations, even those for war and for averting evil, end with an account of the ideal good fortune—a fine crop of corn. In another of the important ceremonies, the fetching of salt from the Gulf of Mexico, the salt was always called corn and procuring plenty of it augured a good crop. Ceremonial use was made of cornmeal as was the custom among the pueblos. With the Papagos this meal had to be made of "flatheaded-corn," generally twin ears, the juxtaposed sides of which were flattened. No attempt was made to raise such ears—they were simply saved as they occurred. 243
[253]

Freeman (12) isolated a race of native corn, which he designated Papago sweet corn, from grains obtained from the Papago Indians of southern Arizona. He originally secured two types which he crossed, and from this eventually developed the strain of Papago sweet corn. This, however, has not been entirely successful since it contains little sugar and is not a good yielder.

CUCURBITS

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[262]

Pumpkin, *hahri* (*Cucurbita pepo*)Cushaw, Crookneck pumpkin, *coskac'ki* (*Cucurbita moschata*)Muskmelon, *uuii hahri* (*Cucumis melo*)Watermelon, *kihpi* (*Citrullus citrullus*)

Both *Cucurbita pepo* and *C. moschata* are commonly regarded as aboriginal species among the Papagos, although this has not been definitely established. The Spanish records refer to the Pima-Papago people as growing *calabazas* (10, 18), a word which was used quite loosely in old Spanish writings to denote pumpkins, squashes, or melons. Mange (18), in 1697, spoke of *melones* (probably muskmelons) and *sandias* (watermelons) as growing on the Gila and it is quite possible that these were grown from seed given by Kino, since this was ten years after his arrival. Other authorities state that watermelons were given the Indians by the Spaniards (27). Pumpkins were planted in the rainy season with an invocation like corn. When harvested the rind was peeled off in a long spiral which was hung from the house roof to dry, after which it was tied into bundles and stored in jars. Muskmelons and watermelons are grown at only a few places, such as San Xavier, where there is plenty of water. No attempt is made to store them.

● [251]

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Coyote tobacco, *wiupuri* (*Nicotiana trigonophylla*)Yaqui tobacco, *wiiw* (*Nicotiana tabacum*)

The first species used was the native *Nicotiana trigonophylla*, which grows wild on Elder Brother's mountain and is still used to some extent. In addition to this the Papagos and Pimas, at least fifty years ago, were cultivating the common tobacco (*N. tabacum*). Seeds of this Yaqui tobacco, as the Papagos called it, were probably traded from Mexico. These seeds, in the possession of old men who did the tobacco raising, were considered very valuable and sometimes given as gifts.

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243 generations ago, when they learned more about it in Mexico. Many old people knew no flour in their youth, save that from wild seeds. One reason for this may be that until government wells were dug in the flats they were not able to live there in the cool weather when wheat should be planted.

At present most families raise enough wheat for their own use, planting in February and harvesting in May. After the field is plowed, wheat is planted by hand and the ground then harrowed. Occasionally the planter mixes his seed wheat with ashes and scatters the two together (7). The method of harvesting is that used in Spain in the seventeenth century, and consists in cutting the wheat with a scythe or sickle, then threshing it on a threshing floor—a circular patch of hardened ground, belonging to the patriarchal family in common.

When wheat is to be threshed three horses are hitched abreast, the inner one tethered by a long rope to the pole, and are driven round and round to trample the grain. One man walks behind and drives them, while one keeps the wheat stalks raked evenly over the threshing floor.

For winnowing the people wait for a windy day, then place the grain in large winnowing baskets about three feet across and toss them until the chaff is blown away. Wheat is stored in grass granaries three or four feet high and about four feet in diameter (7). When flour is needed the [252] grains are softened with water and pounded in a mortar with a stone pestle. The grain is now dried on the roof in the sun and then shaken in baskets until the hulls are blown away. Most of the wheat used by the Papagos is ground with the metate and mano, although some of it is now ground on the grinding mill.

243 The Papagos cultivate chiefly Sonora wheat (*Triticum aestivum*) which is very drought resistant. They use it for making their native breads, but it does not make a good leavened bread on account of its low percentage and poor

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This stuffed head was fastened on top of the hunter's²²⁴ head with buckskin strings. Two pieces of buckskin were worn over the body to the knees, the one in front which came above the chin being white to imitate the deer's belly, while that in the rear was blackened with soot to make it look like the deer's back; the arms and legs were smeared with white clay. In hunting the Headbearers wore the disguise and walked on all fours, rubbing against bushes and imitating the sound of female deer, and thus could get within easy shooting distance.

The deer meat was usually cut into thin strips and sun-²⁵¹ dried on the spot. The tendons were carefully cleaned and²³⁷ kept, the long black tendons for bowstrings, the shorter ones for fastening foreshafts. The brains were kept for tanning and the hide folded up to be used as described elsewhere in this paper. The fat was used to mix paint and for greasing the body.

Arizona white-tailed deer, found in the mountains, was²²⁴ also stalked in disguise. The antelope was much more rarely hunted. Bear (*Ursus americanus*) seems never to have been hunted by the Papagos.

The mountain sheep has for a long time been found only in a few inaccessible mountain slopes and canyons. Once, however, it must have been plentiful, as the Spaniards in the early eighteenth-century found on the Gila a midden heap of six thousand horns of animals, deer, and mountain sheep (18). Later Anza (4) found such piles in the western desert. Only an old Sand Papago from Sonora, however, had any recollection of mountain sheep hunting.

Turkeys were usually shot with arrows when they were²²³ roosting but seem to have been used only for their feathers, never for food. Coyotes (*Canis lestes*) were also sometimes²²⁴ shot. Although nothing was learned of the utilization of the peccary (*Pecari angulatus*) as food it seems reasonable to suppose that the Papagos did eat this animal since it was commonly eaten by their neighbors, the Pimas.

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plants bloom just before the rainy season so that during the summer honey was plentiful. As a confection people sometimes chewed acorns (*Quercus emoryi*) and squash seeds.

The meat of large game was usually cut into thin strips and sun-dried by the hunters on the spot, although in cold weather a man might bring home his kill and eat some of it fresh, then cut up and dry any remainder. These dried strips, which at best did not keep long, were hung from the roof, and when needed were pounded soft with a stone and boiled.

Fresh meat could be either grilled or boiled. For grilling, venison was cut in strips, rabbits were skinned, since the skin was useful, and birds were roughly plucked. Birds and rats could be roasted in the ashes but the skin was left on for protection. Or, meat was boiled in a jar directly over the fire. Wild pepper (*Capsicum frutescens* var. *baccatum*), added to the meat was a great delicacy. A favorite dish was a stew of rabbit and various roots. The desert tortoise (*Gopherus agassizii*) was always ash-roasted, after cracking the shell with a stone, pulling out the entrails and inserting hot pebbles.

The worms used were gathered by women who pinched off their heads and squeezed out the entrails, leaving the outer portion which was lengthened in the process to a narrow string six inches long. They braided these strings, put the braids in carrying nets and went back for more.

The fresh worms, fried on the tortilla sheet in their own fat, made a feast in which everyone indulged while they lasted. The surplus was dried and stored but kept better if pit-baked before drying. One informant said "they were the best tasting food we had."

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basket bowl constituted the drum, and a small basket might²⁸⁵ serve as a drinking cup. All these because of the hard usage received were usually made of willow throughout, but for the water-tight vessels willow was essential as it swelled and filled the interstices.

The water bottles (no longer used) were tall, slender bottle shapes with an incurving neck. They were smeared outside with a gum-like secretion from the white brittlebush^[314] (*Encelia farinosa*).

The basket granaries seen were about three feet high²⁸⁵ and sloping up gradually from a two-foot base. The warp²⁵¹ element was beargrass (*Nolina erumpens*) or wheat straw when the latter was available; the weft, mesquite bark (*Prosopis velutina*). ((For details see Kissell, 16).

The tools for coiled basketry are awls with points of²⁸⁵ varying length, at present made of steel but formerly of mesquite wood, generally with a handle of creosote bush wood (*Covillea glutinosa*).

COTTON SPINNING AND WEAVING

Weaving was a rare art practiced by a few old men.²⁸⁶ One who wanted a cotton blanket or skirt would trade for^[437] the cotton, either from the few who raised it or from the Pimas. He might be able to have the spinning done at home but generally he brought the load of raw cotton to the weaver, with the gift of a large basket, beads, or dried^[437] produce. This was the price for the weaving.

The weaver called in all his neighbors for a spinning bee, giving them their meals as pay. Both men and women^[276] could spin but it was a favorite occupation of old men. They²⁸³ first ginned the cotton by putting it in a basket bowl and working the seeds out with a stick. To separate the fibers the worker twanged his bow string over them, causing the topmost fibers to twist around the string. This method is described by Spier (23) for the Maricopa who perhaps learned it from the Pima. The cotton was spun on a spindle of arrow weed (*Pluchea sericea*) eighteen inches high, with